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**SEATTLE CITY LIGHT WORK ORDER #89-6
1989 QUARTERLY MONITORING OF THE GEORGETOWN FLUME**

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LOCATION OF SAMPLING POSITIONS, GEORGETOWN FLUME

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I. INTRODUCTION

The Georgetown Steam Plant Flume was cleaned in November 1985. In March, 1987, the Boeing Company was given 90-day notice of cancellation of its permit to dispose process cooling water into the flume. The permit was revoked May 22. During April, 1987, Raven Services Corporation undertook a project by authorization of Seattle City Light Work Order #87-5 to determine the extent of polychlorinated biphenyl oil contamination and other tests in the steam plant drainage ditch and the flume to determine if any contaminants had reentered the system. As a result of that study, some recontamination of the flume system was found to have occurred. Documentation and chronology of the recontamination of the flume system was presented in the report for Work Order #87-10, page 16. After the time of the study, the Boeing company sealed the storm drain spouts and cooling water plumbing that fed its industrial site waters to the flume. A monitoring of the flume was conducted in July, 1988, as authorized by Seattle City Light Work Order #88-12, to reassess the extent of PCB contamination. Further quarterly monitoring will ensue as authorized by this present work order. Sampling for the work reported here occurred April 26, 1989.

II. SAMPLING METHODOLOGY

A. Container and Sampling Equipment

All samples were placed in 30 ml wide-mouth glass containers that had been precleaned. The metal screw cap lids were lined with aluminum foil. The precleaning procedure involved scrubbing with a special petrochemical dissolving soap [HarborMaster Products, Inc., Edmonds, Washington]. The terminal end of the brush applied had sufficient bristles to scrub the seam where the side connects with the bottom. A final rinsing with methylene chloride was undertaken to remove any invisible greases and detergent residues.

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Scoops and collection pans are laboratory grade stainless steel. Tools were cleaned with the aforementioned detergent and rinsed with methylene chloride. The tools were buffed free of rust before arriving at the site.

B. Field Observations

Data on the collection process and observations of the physical nature of the samples were kept in the bound field log book. The format for this book is chronological.

C. Sampling Strategy

In accordance with EPA SW-846, sampling strategy was chosen from sections most analogous to the nature of the site. These sections are "waste piles" [1.4.3] and "landfills" [1.4.4]. Individual decisions were required for the uneven distribution of the flume sediments. In addition, access to all the sampling areas is somewhat dependent upon where holes occur in the mesh covering at the top of the flume.

D. Sample Collection

Method 8080 in the EPA SW-846 manual describes the protocol for handling of organochlorine pesticides and polychlorinated biphenyls. Compliance with these instructions necessitated using glass containers and specified conditions for refrigeration. All samples in our case were delivered to the laboratory in time to comply with the maximum seven days storage for extraction and thirty days for complete analysis.

The sediments were shallow, and since access to the sample sites was restricted by the wire heavy mesh across the top of the flume, a special device was used in the form of an 8 cm stainless steel spoon bent to a 90° angle and attached to a 1/2" diameter 7' long stainless steel pipe. The spoon was ferreted through holes in the mesh and used as a scoop against the floor of the flume. Compositing was accomplished in a stainless steel 30 cm diameter mixing bowl.

Wood cores were specified for this project, however, since the wire mesh prevented the use of the corer upstream of Myrtle Street, a core was obtained there. Raven has since devised a corer that can sample any of the wood floor locations for future use. Sampling locations are shown in the Figure.

E. Analysis

Samples, stored no longer than five days at 4° C, were extracted with methylene chloride and taken up with pesticide grade hexane. Samples were pre-treated with Florisil filters to remove residues that interfere with the PCB determination [cleanup modification of USEPA Method 3540, as specified by 40CFR136]. The samples were analyzed by a modification of the packed column gas chromatography procedure described in Method 3550. The gas chromatography mass spectrometry method was used. Concentrations below 0.01 ppm are at the detection limit, but concentrations below 1 ppm are not quantified. QA/QC and raw signal data are available on request.

III. RESULTS

Temperatures, as recorded with the $\pm 0.05^{\circ}$ C immersion thermometer, were air--22.0, water in flume head--21.5, water at doublepipes head--21.0. State of the tide was 3.5 ft. referenced to Seattle tides. The flume had been emptying of tidewater since 7:30 a.m. PCB results on Table I show that PCB residues remain in patches of the flume head system, where 28 ppm were found in the flume head sediment (composite of two) and 26 ppm were found at the head of the double pipes. Above the tidegates they dropped from 2.17 ppm to <1.0 ppm. Below the tidegates they dropped from 1.94 ppm to <1.0 ppm. The Myrtle Street culvert samples were below 1 ppm. The Myrtle Street wood core was below 2.0 ppm. Precision on this sample was 1/2 that of the sediment samples due to lesser sample weight.

IV. DISCUSSION

The flume head composite concentrations ranged from 123 ppm in 1987, to 14.26 ppm in 1988, to 28 ppm in 1989. PCB residues ranging from several hundred to several tens of parts per million have been reported almost every year in the flume since 1984. The present sediments are supposedly those that entered after the November 1985 cleanup. One can surmise that patches of sediment of varying concentrations exist there today. Perhaps due to some episodic disturbance, PCB-containing sediment was transferred to the double pipe head from the flume head, since the concentration increased from 2.23 ppm last year, to 23 ppm at present. The structural barrier for outflow of sediments from the flume head to the double pipe head is only a few inches above the present sediment surface. Other than by rain, no mechanism is now known to flush the flume head unless someone deliberately hoses it out. The flume below the double pipe mouth appears to have been flushed by daily tidal action sufficiently so that the samples yielded less than 1 ppm.

The differences in Aroclor numbers reported as either 1260 or 1254 probably do not represent a new contamination input. More likely, the PCBs in the flume head that appeared after the cleanup are all from the same input. Each Aroclor is a mixture of isomers, some of which may be more or less volatile or soluble than others, and can change over time. The designation of the Aroclor number is a judgmental interpretation, particularly if the residues are old. One analyst might call a sample "1260," and another, one year later, decide to report "1254." Also, the sediments may contain a mixture of two Aroclors not homogeneously distributed throughout the flume head bottom.

For the next monitoring task, we recommend that sampling at Myrtle Street be dropped, and that two wood cores are obtained between Willow Street and the double pipe mouth. The total number of samples remains at seven. Seattle City Light might consider pumping out the flume head in the near future.

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SAMPLE LISTINGS

TABLE I

Sample #/ # Subsample	Location	PCB Concentration (ppm) 1987	PCB Concentration (ppm) 1988	PCB Concentration (ppm) 1989
GR-1 ¹ /2	Flume head	123	14.26	28
GR-2 /1	Double pipe head	---	2.23	26
GR-3 /4	Above tidegates	10.4	2.17	<1.0
GR-4 /4	Below tidegates	2.3	1.94	<1.0
GR-5 /2	Willow Street Bridge	---	0.25	<1.0
GR-6 /1	Myrtle Street culvert	<1.0 ²	0.26	<1.0
GS-7 /wood	Myrtle Street	---	---	<2.0

NOTE: The 1987 samples were reported as major Aroclor 1254. All 1988 samples were reported as major Aroclor 1260. All the 1989 samples were reported as Aroclor 1254 with mass spectrometer confirmation.

¹ Samples were numbered GR-* for 1987 and 1988 sampling; subsequently changed to GS-* for 1989.

² Four subsamples were composited in 1987.

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SAMPLE DESCRIPTIONS

TABLE II

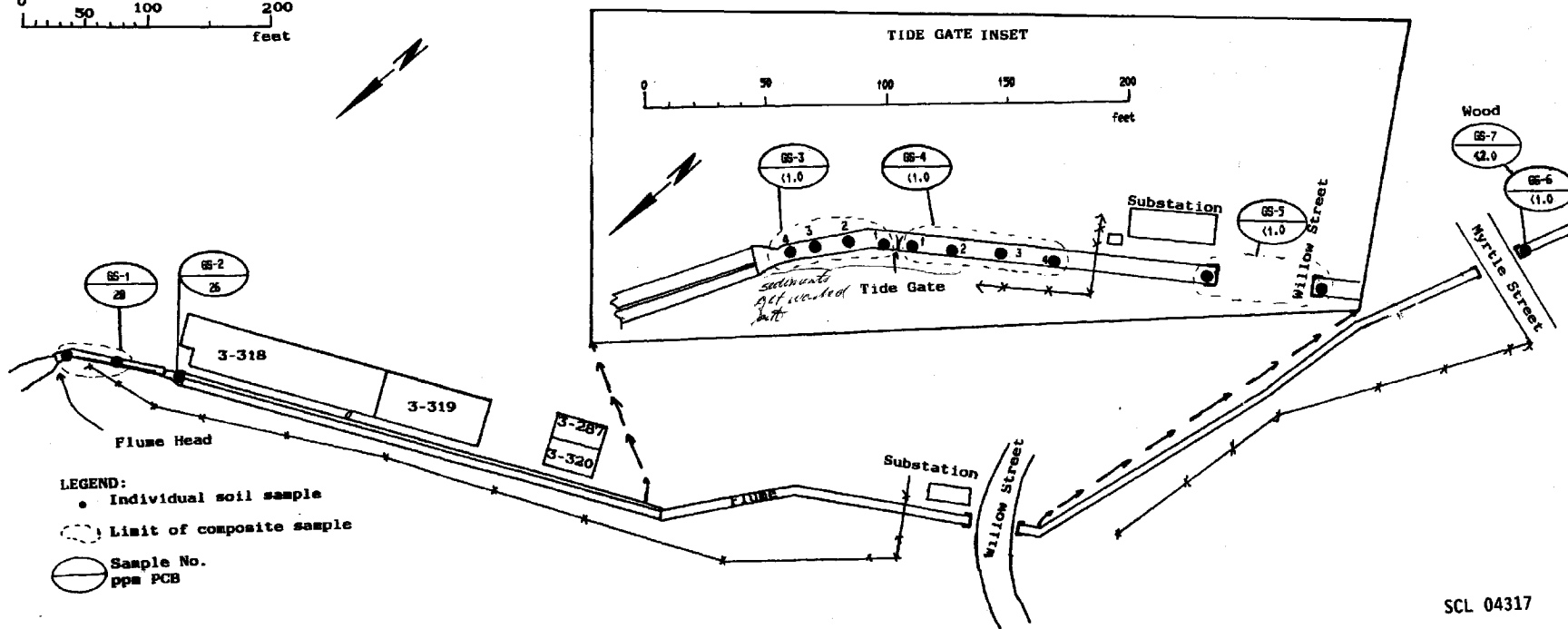
<u>Sample #/ # Subsample</u>	<u>Location</u>	<u>Description</u>
GS-1 /2	Flume head	2" deep sediments under 10" of standing water settled clear. No oil sheen. The first inch was decayed grass in mossy yellow-brown sand. The second inch was oily black sand/silt with odors of hydrogen sulfide
GS-2 /1	Double pipe	1-1/2" deep sediments in shallow pools and patches of stagnant water. Silt with grayish black color and decayed leaves therein.
GS-3 /4	Above tide gate	1" channeled sediments in <1" standing water. 1. Coarse, clean sand. 2. Brown silty sand. 3. Grass/sand/silt. 4. Silt with live grass.
GS-4 /4	Below tide gate	Bare boards until 15' downstream of the tide gate. 1,2. 1/4" deep damp sediments of black silt. 3,4. 1/2" deep oily silt.
GS-5 /2	Willow St. Bridge	3/4" black sand topped with yellow-brown silt in 4" of stagnant water. The eastern sample had fresh sand from recent landscaping on the banks.
GS-6 /1	Myrtle St. culvert head	3/4" brown sand topped with yellow silt/humus. Sand lies in channels.
GS-7 /wood	Myrtle St. culvert	Exposed planks on bottom of flume. Soft but intact wood fibers.

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SCL GEORGETOWN FLUME SYSTEM

RAVEN SERVICES CORP.		
SCALE:	APPROVED BY: <i>mth</i>	DRAWN BY: LSG
DATE: 6/16/89		REVISED LSG
Georgetown Flume System		
LA TERRE ENVIRONMENTAL CONS.	DRAWING NUMBER	89-3-1/4

0 50 100 200
feet



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